

The Variability of the Hawaiian Maile (*Alyxia*
olivaeformis), Apocynaceae

Hawaiian Plant Studies 49

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The "maile" or *Alyxia olivaeformis* Gaud. was a favorite native plant of the old time Hawaiians, and it still is to their modern descendants and to the other local Hawaiian residents of whatever race. The flowers are inconspicuous, and the leaves of the vine are rather small, and of ordinary appearance, but the whole plant has a perfume. A fresh and growing plant has a very faint sweet odor, but if the herbage is crushed, the odor soon intensifies and spreads, and is long lasting. The smell is very like that of new-mown hay (containing *Anthoxanthum odoratum* L.), or like that of the gas phosgene. It was, and is, a Hawaiian tradition at any special gathering to decorate the friends or guests with leis of "maile".

The leis are made by cutting vigorous, straight, young branches of the "maile" and stripping them. If the but end of the cut stem is held in the teeth, then with strong fingernails of the two hands by one long stroke, the epidermis, bark, and all the leaves attached can be stripped from the wooden core. This process bruises the tissue and starts the strengthening of the perfume. The compacted herbage is then pulled out to its original length. It is then pliant and is easily twined into a lei.

An account of this traditional use was given by Neal (1938: 13-14), as follows:

"From a Hawaiian versed in native lore, I learn that the old-timers distinguished five different forms of maile. Maile laulii is fine leaves, maile ha'iwale is brittle, maile launui is large-leaved, maile maluhea is sweet smelling, and maile pakaha has blunt oval leaves. They represent five minor sister goddesses of the hula. Laka, goddess in chief of the hula, was always offered a prayer at the beginning and end of a day's session at the hula school, and as she was believed to be present in her favorite plants — among

them maile, ieie, ti, ohia lehua, ilima — these plants were gathered and placed on her altar in the school hall before classes met. The following is part of an altar prayer to Laka:

Here am I, oh Laka from the mountains,
Oh Laka from the shore
Reside in the wild-twining maile
And the goddess-enwreathing ti.
Thou are Laka,
The god of this altar;
Return, return, abide in the shrine!"

The early botanical explorer Charles Gaudichaud-Beaupré in 1819 collected the "maile" and gave it its scientific name, Alyxia olivaeformis. The plant is a low, straggling vine, but it is not uniform in appearance. It varies mostly in its leaves which are 2, 3, or 4 at a node, and from very narrow to almost round. All botanists who have studied it have agreed that there is but one native species in Hawaii, yet there is a conspicuous variability in the number, size, and shape of the leaves. The Hawaiians have recognized and named several of the varieties. Neal stated that their total was five varieties, three of which had special leaf shapes. People continually bring samples of maile to the Bishop Museum and ask for the scientific names of the several kinds that they have gathered. When told that these kinds are all of one species, they are incredulous and disappointed. They depart dissatisfied. There is some variability due to age or position, and one can sometimes find leaves of more than one shape on a single plant. However, if mature, flowering or fruiting branches are taken, they regularly have leaves of a single characteristic shape. Asa Gray in 1888 described one kind as a variety; and W. Hillebrand in 1888 added two more varieties.

After a review of the problem, a classification has been devised, and it is here presented. Since there are no differences in the flowers or fruits, and since there is variability in the leaf characters, the kinds here described and named are judged to be formae.

Key to Alyxia olivaeformis and its forms

- A. Blades elongate lance-linear, less than 7 mm wide, 4.9-5.1 cm long. f. linearis.
- A. Blades broader,
 - B. Blades elliptic,
 - C. Blades narrowly elliptic,

- D. Blades rounded elliptic,
 - E. Blades 2½-4-times as long as wide.
 - f. angusta.
 - E. Blades 2-times as long as wide.
 - f. elliptica.
 - D. blades fusiform elliptic. f. cuneata.
- C. Blades broadly elliptic,
 - F. Blades narrowed at each end,
 - G. Blades twice as long as wide.
 - f. olivaeformis.
 - G. Blades thrice as long as wide.
 - f. fusiformis.
 - F. Blades rounded at one or both ends,
 - H. Blades suborbicular elliptic, 0.8-3
 - cm. long. . . f. myrtillifolia.
 - H. Blades narrower,
 - I. Blade apex subacute. f. subacuta.
 - I. Blade apex obtuse,
 - J. Blade base cuneate. f. ovata.
 - J. Blades broadest near the base,
 - K. Blades 1.6-5.3 cm long, 11-36
 - mm. wide. f. rotundata.
 - K. Blades (4.5-) 5-9 cm long, 19-
 - 43 mm wide. f. ampla.
 - B. Blades broadest near the base,
 - L. Blades lanceolate. . . . f. lanceolata.
 - L. Blades ovate to ovate lanceolate. f. ovata.

Alyxia olivaeformis Gaud., forma *olivaeformis*, Bot. Voy. *Uranie* 451, 1829; H. Mann, Am. Acad. Arts Sci. Proc. 7: 197, 1867; Wawra, Flora 57: 365, 1874; Hillebrand, Fl. Haw. Is. 298-299, 1888.

Gynopogon olivaeformis (Gaud.) K. Schum., (as *oliviformis*), Engler's Nat. Pflanzenfamilien IV, 4(2): 151, fig. 56F, 1895; Heller, Minn. Bot. Stud. 1: 877, 1897; Hochreutiner, *Candollea* 5: 179, 1932; Degener, Pl. Hawaii Nat. Park 249, pl. 71, 1930.

Hawaiian Name: maile.

Pl. 1, fig. f.

Original Diagnosis: "pedunculis axillaribus solitariis, 2-4-floris; foliis ternis, elliptico-oblongis, utrinque acutis, membranaceis; fructibus olivaeformibus."

Expanded Diagnosis of Holotype: Leaves ternate; blades elliptic, twice as long as wide, acute at each end, 3.9-4.3 cm long, 17-18 mm wide.

Expanded Description: Leaves opposite or ternate, 2.6-7 cm long, 10-32 mm wide.

Holotype: Iles Sandwich = (Hawaiian Islands),
C. Gaudichaud (P). Type examined.

Kauai: Power Line Trail, L. H. MacDaniels 704;
and eight others.

Oahu: Koolau Range, Halawa, St. John 20,382;
and fourteen others.

East Maui: Haleakala, Faurie 457.

Hawaii: Manuka, G. W. Russ; and three others.

Forma ampla forma nova.

A. sulcata H. & A., Bot. Beechey Voy. 90, 1832.

Hawaiian Name: maile lau-nui = (large leaved maile).
Pl. 1, fig. 1.

Diagnosis Holotypi: Foliis oppositis, laminis
5-6.3 cm longis 2.3-3.4 cm latis ellipticis apice
rotundata.

Diagnosis of Holotype: Leaves opposite; blades
5-6.3 cm long, 2.3-3.4 cm wide, elliptic, the apex
rounded.

Expanded Description: Blades (4.5-) 5-9 cm long,
1.9-4.3 cm wide.

Holotypus: Kauai, Hoolulu Valley, Napali Coast,
Dec. 5, 1964, S. Carlquist 1,659 (BISH).

Kauai: Wahiaua Bog, B. C. Stone 1,663; and one
other.

Oahu: Koolau Range, Palolo-Olympus Trail, D. W.
Garber 284.

East Maui: Nahiku, H. L. Lyon.

Hawaii: Glenwood to Olaa, W. M. Giffard 321;
and one other.

Forma angusta forma nova.

Pl. 1, fig. b.

Hawaiian Name: Maile lau-li'i = (small leaved maile).

Diagnosis Holotypi: Foliis oppositis vel ternatis,
laminis anguste ellipticis 1.4-2.5 cm longis 5-8 mm
latis marginibus revolutis.

Diagnosis of Holotype: Leaves 2-3 at a node; blades
narrowly elliptic, 1.4-2.5 cm long, 5-8 mm wide, the
margins revolute.

Expanded Description: Blades 0.5-4.3 cm long,
5-12 mm wide.

Holotypus: East Maui, Auahi, 3,000 ft alt., Feb.
1953, J. F. Rock 27,000 (BISH).

Oahu: Koolau Range, W. Hillebrand & J. M. Lydgate;
and one other.

Waianae Mrs.: Puu Kumakalii, F. R. Fosberg 13,649.
Molokai: Makalelau, C. N. Forbes 125.Mo.; and one other.
East Maui: Auwahi, L. W. Bryan; and one other.
West Maui: Olowalu Valley, Forbes 2,288a.M.

Forma cuneata, forma nova
Pl. 1, fig. d.

Diagnosis Holotypi: Foliis oppositis, laminis 2.2-5.5 cm longis 8-13 mm latis anguste ellipticis basi cuneata.

Diagnosis of Holotype: Leaves opposite; blades 2.2-5.5 cm long, 8-15 mm wide, narrowly elliptic, cuneate at base.

Expanded Description: Blades 2.2-6.5 cm long, 8-26 mm wide.

Holotypus: Oahu, Waianae Mts., Puu Hapapa, 1,800 ft. alt., G. Spence 44. (BISH).

Kauai: Kokee, A. M. Alexander & L. Kellogg 5,247.

Oahu: Koolau Range, Aiea Trail, M. Kerr; and four others.

Waianae Mts., Kamananui, 1,500 ft. alt., B. C. Stone 889; and two others.

Molokai: Manawai-Kahananui ridge, 600 m alt., F. R. Fosberg 13,388; and two others.

East Maui: Auwahi, C. N. Forbes 1,978.M.; and one other.

A plant of this forma, with blades partly white, mostly with white margins, or one half white, or with a broad white longitudinal stripe, and the drupes with white stripes, was collected above Kunia, Waianae Mts., 3,000 ft. alt., Oct. 5, 1974, by Walter Pomroy. This is, of course, a freak, but it is the sort of mutant that is sought by horticulturists.

Forma elliptica forma nova.

Pl. 1, fig. i.

Diagnosis Holotypi: Foliis oppositis, laminis 1.2-3.2 cm longis 8-13 mm latis.

Diagnosis of Holotype: Leaves opposite; blades 1.2-3.2 cm long, 8-15 mm wide.

Holotypus: West Maui, Olowalu Valley, lateral ridge, May 16, 1920, C. N. Forbes 2,388b.M. (BISH).

Kauai, Alakai Swamp, B. C. Stone 1,544; and one other.

Oahu: Kawailoa, Forbes 2,091.O; and one other.

East Maui: Ulupalakua, G. C. Munro; and one other.

Lanai: W. Hillebrand & J. M. Lydgate.

Forma fusiformis *forma nova*
Pl. 1, fig. h.

Diagnosis Holotypi: Foliis oppositis vel ternatis, laminis ellipticis vel oblanceolatis, triplo longioribus quam lateralibus, 3-6 cm longis 14-28 mm latis basi cuneata.

Diagnosis of Holotype: Leaves opposite or ternate; blades elliptic to oblanceolate, thrice as long as wide, 3-6 cm long, 14-28 mm wide, the base cuneate.

Expanded Description: Blades 2.5-8.5 cm long, 11-32 mm wide.

Holotypus: Hawaii Island, Puna, July 7, 1915, Forbes & Thurston 1,045.H. (BISH).

Kauai, Kokee, St. John et al. 10,694; and one other.

Oahu: Koolau Range, Wailupe, D. W. Garber 181; and five others.

Waianae Mts., Makua, St. John 17,663.

East Maui: Nahiku, H. L. Lyon.

Hawaii: Kilauea, F. R. Fosberg 33,276; and five others.

Forma lanceolata (Hbd.) comb. nov.

A. olivaeformis Gaud., var. lanceolata Hbd., Fl. Haw. Is. 299, 1888.

Pl. 1, fig. e.

Original Diagnosis: "Leaves ovate-lanceolate, acute, often emarginate at the base, binate, ternate or quaternate, 1½-1 3/4' X 6-8? Peduncles umbellately 3-5-flowered. Lobes of corolla ½ the length of the short tube. Drupes oblong, 6-7", obtuse at both ends."

Expanded Description: Blades 2-5 cm long, 10-22 mm wide.

Holotype: West Maui, Kaanapali, woods, W. Hillebrand (B). Type destroyed. Isotype (BISH).

Kauai, Waininiua trail, 3,500 ft alt., A. K. Chock 900.

Oahu: S. Opaeula Gulch, Koolau Mts., 500 m alt., F. R. Fosberg 8,847; and nine others.

Waianae Mts.: eight others.

Molokai: Mts., above Puu Kolekole, C. N. Forbes 201.Mo.

West Maui: mauka of McGregor, O. Degener et al. 22,073.

Forma linearis *forma nova*

Pl. 1, fig. a.

Diagnosis Holotypi: Laminis lancei-linearibus 3-6

cm longis 5-7 (-9) mm latis ambitu acutis.

Diagnosis of Holotype: Blades lance-linear, 3-6 cm long, 5-7 (-9) mm wide, acute at each end.

Holotypus: Oahu, Koolau Range, Palolo, Kaau-Waiomao Ridge, 1,800 ft alt., Dec. 5, 1943, H. St. John 20,370 (BISH).

Oahu: U. S. Exploring (Wilkes) Expedition, (the part with the elongate leaves), (US).

Forma myrtillifolia (Gray ex Hbd.) comb nov.

A. olivaeformis Gaud., var. myrtillifolia Gray ex Hbd., Fl. Haw. Is. 299, 1888.

A. myrtillifolia (Gray ex Hbd.) Lévl., Fedde Repert. 10: 155, 1911.

Pl. 1, fig. g.

Original Diagnosis: "Leaves in whorls of 3 and 4; small oblong or obovate, 4-9" X 2-4", obtuse at both ends or contracted at the base, sometimes orbicular. Peduncle umbellately 4-5-flowered. Calyx and corolla mostly 5-lobed. Drupe short ovoid, 4-6"."

Expanded Description: Leaves in whorls of 3-4 or opposite; blades broadly elliptic, 0.8-3 cm long, 5-15 mm wide.

Specimens Cited: "Lanai! E. and W. Maui!"

Lectotype: W. Maui, Waikapu, W. Hillebrand (B). Isotype (BISH).

Kauai: Alakai Swamp Trail, M. R. Crosby & W. R. Anderson 1,991.

East Maui: s. slope Haleakala, C. N. Forbes 2,123.M; and two others.

Lanai: Poomai, G. C. Munro 91; and three others.

Hawaii: Kanehaha, Kona, Forbes 250.H.

Forma obovata forma nova

Pl. 1, fig. f.

Diagnosis Holotypi: Foliis oppositis vel ternatis, laminis 2.1-3.5 cm longis 14-24 mm latis.

Diagnosis of Holotype: Leaves opposite or ternate; blades obovate, 2.1-3.5 cm long, 14-24 mm wide.

Holotypus: Hawaii Island, kipuka in Flow of 1855, June 7, 1915, C. N. Forbes 749.H. (BISH).

Forma ovata (Hbd.) comb. nov.

Pl. 1, fig. n.

A. olivaeformis Gaud., β var. ovata Hbd., Fl. Haw. Is. 299, 1888.

Original Diagnosis: "Leaves mostly opposite,

rarely ternate, broadly ovate or rhomboidal and mostly obtuse, $1\frac{1}{4}$ - 2' \times $3/4$ - $1\frac{1}{4}$ '. Drupes ovoid or obovoid, about 6" long. - A. sulcata Hook. & Arn."

Revised Diagnosis: Blades ovate, but narrowed to the apex.

Holotypus; Hawaiian Islands, Oahu Island, "on both ranges." [Hillebrand], (B). Type destroyed. Isotype (BISH). Isotype examined.

Kauai: Halemanu, D. Herbst 1,028; and one other.

Oahu: Koolau Range, Kipapa Gulch, St. John 11,678; and eleven others.

Waianae Mts.: Mt. Kalena, M. L. Grant 7,436.

Molokai: Halawa, Forbes 482.Mo.

East Maui: Kipahulu, St. John & R. J. Catto 17,802.

West Maui: Puu Kukui, M. R. Crosby & W. R. Anderson 1,870; and one other.

Hawaii: Waiakea to Olaa, Forbes 566.H; and one other.

Forma rotundata forma nova

Hawaiian Name: maile pākāha = (greedy maile).

Pl. 1, fig. k.

Diagnosis Holotypi: Laminis late ellipticis obtusis 1.6-3.6 cm longis 12-23 mm latis.

Diagnosis of Holotype: Blades broadly elliptic, obtuse, 1.6-3.8 cm long, 12-23 mm wide.

Expanded Description: Blades 1.6-5.3 cm long, 11-36 mm wide.

Holotypus: Oahu, Koolau Range, Pupukea Trail, in trees, 1,400 ft alt., 26 June 1964, M. R. Crosby & W. R. Anderson 1,567 (BISH).

Kauai: Kaholuamanoa, A. A. Heller 2,344; and five others.

Oahu: Koolau Range, Lanihuli summit, E. H. Bryan Jr.; and six others.

West Maui: Olowalu, C. N. Forbes 2,385.M.

Lanai: Mahana, G. C. Munro 59; and one other.

Though he accepted only the species (as Gynopogon olivaeformis (Gaud.) Heller), Degener (1930: pl. 71) gave a detailed drawing of a specimen from Hawaii which seems to represent our forma rotundata. Although no specimens of this forma from the island of Hawaii have been examined, it may well occur there, as it is presently known on the islands of Kauai, Oahu, Maui, and Lanai.

Forma subacuta forma nova

Pl. 1, fig. m.

Diagnosis Holotypi: Foliis ternatis, laminis late ellipticis subacutis 2.7-4.3 cm longis 18-30 mm latis.

Diagnosis of Holotype: Leaves ternate; blades broadly elliptic, but subacute, 2.7-4.3 cm long, 18-30 mm wide.

Expanded Description: Leaves ternate to opposite, 2-5.4 cm long, 12-30 mm wide.

Holotypus: Island of Hawaii, Kiipu, June 26, 1915, C. N. Forbes 940.H. (BISH).

Kauai: Mts. above Ka Loko Reservoir, Forbes 521.K.

Oahu: Koolau Range, Waialae-iki, 1,800 ft alt., B. C. Stone 1,205-A; and ten others.

Waianae Mts., Piko Trail, Mokuleia, R. J. Baker; and two others.

Lanai: Puu Aalii, 900 m alt., F. R. Fosberg 12,513; and six others.

Hawaii: Kipuka Puaulu, J. F. Rock 12,589; and four others.

All the specimens cited in this study are in the Bishop Museum, Honolulu, unless otherwise indicated.

Bibliography

Degener, Otto, 1930. Ferns and Flowering Plants of Hawaii National Park, 1-312, pl. 1-95, figs. 1-45. Neal, Marie C., 1938. Maile. Paradise of the Pacific 5(20): 13-14, ill., February.

Legend

Plate 1, Formae of Alyxia olivaeformis Gaud., from the holotypies. a, forma linearis; b, c, forma angusta; d, forma cuneata; e, forma lanceolata; f, forma olivaeformis; g, forma myrtillifolia; h, forma fusiformis; i, forma elliptica; j, forma obovata; k, forma rotundata; l, forma ampla; m, forma subacuta; n, forma ovata.

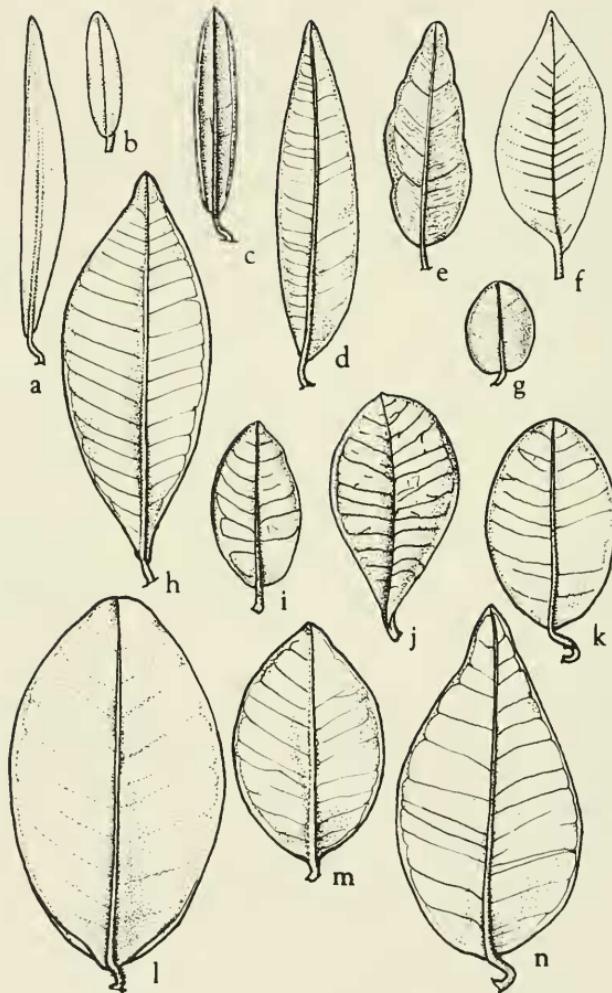


Plate 1
Variability of Alyxia olivaeformis